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INSTITUTE OF GAS TECHNOLOGY

THE GAS INDUSTRY'S OWN EDUCATIONAL AND RESEARCH FACILITY

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GAS ABSTRACTS

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I. GAS INDUSTRY

Conversion Program

Crane, C. P. HIGHWAY TO GAS CONVERSION. *Am. Gas Assoc. Monthly* 33, 9-11, 38, 39 (1951) December.

Consolidated Gas Electric Light and Power Co. of Baltimore was converted to natural gas by dividing their distribution system into 68 "blocks". Each block was properly sectionalized with valves, so that at the proper time each block could be isolated, purged of manufactured gas, and supplied with the incoming natural gas. Newspaper, mail and radio publicity kept the public informed as to the location of the block by block conversion, which was completed between May 1 and Sept. 7, 1950. B. G. Lang

Fundamental Research

NSF: ANGEL OF FUNDAMENTAL RESEARCH. *Chem. Week*, 70, 27-28 (1952) February 2.

The nation is spending about 2½ billion dollars per year for research and development. The Federal Government supplies 60 to 70% of this amount while industry supplies 25 to 35%. Universities account for 5%. Universities are the main contributors to basic research, other agencies featuring short term applied research with the result that basic research is slighted. Research grants to universities tend to concentrate in certain institutions, 50% going to 11 schools. The National Science Foundation plans to sponsor fundamental research in universities on as diversified a geographical and institution scale as possible. J. D. Parent

Gas Industry Statistics

Duff, D. M. UTILITY SALES OF NATURAL GAS UP 15.4 PER CENT. *Oil Gas J.*, 50, 234-235 (1952) January 28.

Utility sales of natural gas in 1951 rose 15% over the volume of the previous year to 4.28 trillion cubic feet. Many AGA gas industry statistics are presented.

J. D. Parent

Mitchell, G. F. RE-VIEWING 1951. *Gas* 28, 29-33 (1952) January.

A rather comprehensive statistical analysis of the growth of the gas industry during 1951 is presented. Such topics as number of customers (over 25,000,000), investment in new facilities, appliance sales and AGA activities are covered. As was expected, natural gas sales increased greatly. Only the Pacific Northwest is now without natural gas. Domestic appliance sales were down considerably with respect to the previous year, but there has been a very great demand for industrial gas equipment.

J. D. Parent

Gas Research

Dept. Scientific and Industrial Research. FUEL RESEARCH 1946-1949. REPORT OF THE FUEL RESEARCH BOARD, WITH THE REPORT OF THE DIRECTOR OF FUEL RESEARCH. 58 pp. (London, H.M.S.O.) (1951).

This report covers the 3-year transition period from wartime activities to post-war reconstruction. After the transfer of the Coal Survey staffs to the National Coal Board in 1947, the Fuel Research organization has been occupied with more efficient use of fuel in both domestic and industrial heating. In addition, studies on carbonization, coke combustibility, briquettes and dry cooling of coke have been pursued. Studies of gasification included automobile gas producers, fluidized gasification, underground gasification, methanation, purification of synthesis gas. Fischer-Tropsch synthesis in laboratory and pilot-scale units was studied. Boiler fuels, steam raising and smoke abatement, as well as coal-fired gas turbine programs have continued. A bibliography of 191 papers by staff-members is given. O. P. Brysch

Industrial Gas Load

Junkison, N. R. GAS IN INDUSTRY. *Gas World* (British) 134, Suppl. 6—13 (1951) December 15. *Gas J.* (British) 269, 41-46 (1952) January 2.

The importance of an industrial load to provide a stable base load is stressed. A historical development of industrial sales in London is presented and the applications of gas to various modern industries are described.

B. E. Hunt

Institute of Gas Technology

TEN YEARS PROGRESS BY INSTITUTE OF GAS TECHNOLOGY. *Petroleum Eng.* **24**, C45, C46 (1952) January: *Gas World* (British) **135**, 78-79 (1952) January 19.

This is a short review of the history, objectives, assets and accomplishments of the Institute of Gas Technology. Quotations from the 1951 annual report of the Institute provide interesting data. The Institute, founded by leaders of the fuel gas industry, is the only organization devoted exclusively to the industry's educational and research needs. J. D. Parent

Italian Gas Industry

Kornfeld, J. A. ITALY'S GAS SYSTEM. *Oil Gas J.* **50**, 54 (1952) February 4.

A pipeline in the Po River Valley of diameter ranging from 3 to 16 inches and handling nearly 250 MMcf per day of 1000 Btu gas has been completed. This is Europe's largest natural gas system. A Pritchard-designed gasoline plant will be completed next year. The gas is very rich, containing 8 to 10 gal. per Mcf. Wells are about 5,000 ft. deep and pressures range from 2200 to 2500 psi. J. D. Parent

Send-Out Gas Selection

Boyer, E. G. IS 100% NATURAL GAS THE ANSWER? Am. Gas Assoc. Paper presented October 15-17 (1951); *Gas Age* **108**, 65-68, 104, 106 (1951) November 8; *Gas Age* **108**, 24-32 (1951) November 22; *Am. Gas J.* **176**, 28-30, 39 (1952) January.

An analysis is presented of the problems connected with the utilization of a natural gas supply which becomes available to a manufactured gas company. Detailed information on application of the results of this analysis to the specific problem of the Philadelphia Electric Company is given. An 800 Btu/cu.ft. 0.58 specific gravity mixed gas was selected as the most suitable send-out gas. H. R. Linden

State Control

UNIT-LAW REVIEWED. *Oil Gas J.*, **50**, 188 (1952) January 28.

The Supreme Court has agreed to review a decree of the Oklahoma Supreme Court regarding the constitutionality of the State's unitization law. J. D. Parent

The following article, the abstract for which appears on the page indicated, also called to your attention:

Rugh, K. W. and Benz, G. R. BUTANE-PROPANE SALES GAIN 26%; USE IN GAS MAKING HOLDS STEADY. p. 54

2. APPLIANCES

Air Conditioning

Friend, W. F. SUMMARY OF PROGRESS MADE WITH GAS ALL-YEAR AIR CONDITIONING. *Heating & Ventilating*, **49**, 87-90 (1952) January.

A survey of the three types of gas-powered air conditioning units has been made as to investment costs and operation costs. The three types considered were absorption refrigeration, adsorption dehumidification and compression refrigeration using a gas-fired internal combustion engine. D. L. Nicol

Appliance Noise

Minchin, L. T. NOISE IN GAS APPLIANCES. *Coke and Gas* (British) **13**, 431-435 (1951) December.

Types and causes of noise are noted. Means for their prevention are described.

B. G. Lang

Burners

Bottom, C. R., Kansas City, Mo. DUAL FUEL JET FOR DUAL FUEL BURNERS. U.S. 2,582,582 (1952) January 15.

These dual-fuel burners have a dual fuel jet. With failure of the gas company supply, an auxiliary or stand-by fuel can be used.

B. G. Lang

Hoeffken, P. W. (assigned to W. M. Hoeffken and O. W. Wegener, Belleville, Ill.) REMOVABLE BURNER FOR GAS HEATERS. U.S. 2,582,331 (1952) January 15.

This burner is for furnaces or heaters. It is mounted on a tray and is easily removed for cleaning or repair. B. G. Lang

Mayer, C. M. (assigned to The Tappan Stove Co.) BROILER BURNER AND RADIANT

SCREEN FOR GAS COOKING RANGES. U.S. 2,582,642 (1952) January 15.

This burner is a combination oven and broiler burner. A radiant screen is incorporated to increase the heat concentration of the broiler.

B. G. Lang

Zink, J. S. and Reed, R. D. (assigned to J. S. Zink, Tulsa, Okla.) GAS-AIR BURNER PROVIDED WITH ANTI-FLASHBACK MEMBER. U.S. 2,582,577 (1952) January 15.

This gas burner is provided with an anti-flashback member. The burner head is a series of concentric collars providing a number of concentric annular passage-ways.

B. G. Lang

Conductivity of Insulation

Rowley, F. B., Jordan, R. C., Lund, C. E. and Lander, R. M. GAS IS AN IMPORTANT FACTOR IN THE THERMAL CONDUCTIVITY OF MOST INSULATING MATERIALS. *Heating, Piping & Air Conditioning* 23, 103-109 (1951) December.

A study of various insulating materials was made at atmospheric pressures and subatmospheric pressures to determine the convection and conductivity effect of air trapped within insulating materials. This study shows that convection effects are insignificant if air spaces are less than 0.25 inches wide. Reduction of air pressure within insulating material from 1 atmosphere to 0.1 microns Hg. lowered the conductivity of all insulating materials from 60 to 95%.

D. L. Nicol

House Heating Efficiency

Mackey, C. O. and Gay, N. R. EFFECTIVE HEAT AND HEAT LOSS CALCULATIONS. *Heating, Piping & Air Conditioning* 23, 94-96 (1951) December.

The subject of heat loss calculations and their dependency upon the method of heating is discussed in relationship with the conventional heat-loss equations. Examples show a difference between warm-air heating, floor panel heating and radiation heating. The average coefficient of heat transfer by combined convection and radiation was respectively 1.2, 2.0 and 2.9 Btu/hr./sq.ft./°F. for the three methods.

D. L. Nicol

Large Scale Cooking

Longley, C. H. FEEDING THE STUDENTS OF LIVERPOOL UNIVERSITY: A LESSON IN LARGE SCALE COOKING. *Gas World* (British) 135, Suppl. 12-18 (1952) January 19.

This is a detailed discussion of a large gas kitchen. Included is information for sizing equipment, kitchen layout, and gas consumption per meal.

B. G. Lang

Pilot

Peterson, G. A., (Australia) SAFETY PILOT FOR GAS BURNERS. U.S. 2,578,087 (1951) December 11.

This safety pilot controls by force exerted through the differential thermal expansion of 2 rods. It is so constructed that there is less chance for pilot failure, and the pilot flame is utilized. It is not a 100% safety shut-off.

B. G. Lang

Range Burner

Meriam, J. B. ARTICLE SUPPORT AND RELATIVELY ADJUSTABLE GAS BURNER. U.S. 2,580,939 (1952) January 1.

A range-top burner is described which has the double purpose of changing gas flow and relative burner-grate distance. The burner is so adjusted that as the gas flow increases the burner is lowered to permit additional combustion space below the grate. The burner is designed so that the change in burner height is achieved by rotation of burner and feed tube around the gas manifold as an axis. The gas rate is controlled by the relative alinement of two holes, one in the manifold wall and the other in the rotable burner-connection sleeve. The burner rotation around the manifold is controlled by a screw handle which pushes against a lever extension on the burner-tube.

D. L. Nicol

Sales Outlook

Ruthenburg, L. THE OUTLOOK FOR GAS APPLIANCES. *Gas Heat* 3, 42-43 (1952) February; *Am. Gas Assoc. Monthly* 34, 9 (1952) January.

The drop-off in gas appliance sales was a normal decrease after the "scare buying" due to the outbreak of the Korean conflict. Neglecting the 1950 sales figures, the 1951 sales are high.

B. G. Lang

3. COMBUSTION AND INDUSTRIAL FURNACES

Flame-Failure Control

Thomson, E. C. (assigned to Combustion Control Corporation) FLAME FAILURE CONTROL SYSTEM. U.S. 2,579,883 (1951) December 25.

Flame-failure control systems are described, with mention of "unsafe failures". This system is designed to be free of these failures. A 4-second delay is built in to prevent false-alarm responses due to flickering of the flame.

B. G. Lang

Gas Turbines

Kadenacy, M. APPARATUS FOR PRODUCING GAS UNDER PRESSURE. U.S. 2,579,321 (1951) December 18.

This invention relates to an apparatus for producing a supply of gases under pressure or moving at high velocity which may be used for jet propulsion, for the operation of a gas turbine or other prime mover.

E. J. Pyrcioch

AN ALLEN AUXILIARY SERVICE MARINE GAS TURBINE. *Gas Oil Power* (British) 44, 265-277, (1951) November.

This article describes the gas turbine-driven alternator which was developed for the Admiralty by the W. H. Allen, Sons & Co., Ltd., under a contract granted at the beginning of 1948. The basic design used is an open-cycle set having an axial-flow compressor, driven by a two-stage turbine with an annular two-pass cross-flow heat exchanger. The Allen alternator is of the open, self-ventilated, rotating-field, salient pole type rated to develop 1000 KW. Some of the basic design particulars are: maximum rating at power turbine coupling: 1,512 bhp.; thermal efficiency 19.75%; maximum gas temperature, 650°C; compressor speed, 8,000 rpm; heat-exchanger thermal ratio, 70%. The turbine is provided with Lucas Simplex-type burners and the fuel is diesel oil. An electric motor is used for start-up purposes. The unit, without heat-exchanger, has been on test for approximately a year resulting in a comprehensive series of performance, governing and endurance tests. E. J. Pyrcioch

Gas Utilization Research

Huebler, J. GAS KEEPS IN STEP WITH DEMANDS OF MODERN PRODUCTS AND PROCESSES. *Gas* 28, 53, 54, 59 (1952) January.

A summary of the recent advances in the three phases of research on gas utilization is given. These are (1) basic studies, (2) equipment and process improvement, and (3) equipment and process development. D. L. Nicol

High Temperature Furnaces

Hayman, R. F. THE PRODUCTION OF HIGH TEMPERATURES IN INDUSTRY BY TOWN GAS. Institution of Gas Engineers Comm. No. 396; *Coke & Gas* (British) 13; 431-434 (1951) December.

Design of equipment for rapidly heating a space or object to temperatures above 1350°C. is considered from the standpoint of (1) temperature (2) fuel expenditure and (3) time. Selection of heating systems, combustion chamber design, experimental modifications of the system and materials of construction are discussed. D. L. Nicol

Industrial Burners

Buck, R. M. (assigned to Affiliated Gas Equipment, Inc.) GAS BURNER INCLUDING COMBUSTION TUNNEL. U.S. 2,581,075 (1952) January 1.

An industrial tunnel burner is described. Features include high turn-down ratio and high combustion rate. These are achieved by the use of an annular-ring orifice at the burner throat. The length of the orifice is equal to the outside diameter of the annulus. The small slot reduces flashback and promotes additional turbulence across the face of the orifice plug.

D. L. Nicol

GAS BURNERS AND COMBUSTION SYSTEMS. PART 2. *Ind. Heating* 18, 2164-2176 (1951) December.

The author continues the discussion of industrial gas burners expanding to cover the four types of power gas-air mixing, together with burners used on the blast type combustion system. The four gas-air mixing devices are high-pressure gas entrainment, unit blower, central

partial premix and central total premix. The burners considered are line, tunnel, radiant cup and open-firing tunnel types.

D. L. Nicol

Radiant Burner

Duchene, R., (assigned to Gaz de France, Ex Compagnie du Gaz de Paris) METHOD AND APPARATUS FOR HEATING BY THE LAMINAR COMBUSTION OF GAS IN THE INTERIOR OF DULL RADIATION TUBES. U.S. 2,578,520 (1951) December 11.

A radiant heat exchanger is described. Gas is burned at a slow rate in an enclosed tube by providing gravity separation of air and gas.

D. L. Nicol

The following articles, the abstracts for which appear on the pages indicated, are also called to your attention:

Calcote, H. F. ELECTRICAL PROPERTIES OF FLAMES. p. 58

Pray, H. A. RESEARCH IN CORROSION, OXIDATION AND DETERIORATION OF METALS UNDER PRODUCTS OF COMBUSTION OF GASEOUS FUELS, p. 64

FUEL RESEARCH 1946-1949. REPORT OF THE FUEL RESEARCH BOARD. p. 45

4. CARBONIZATION AND GASIFICATION

Coal Carbonizing Properties

Davis, J. D., Reynolds, D. A., Wolfson, D. E., Ode, W. H., and Naugle, B. W. CARBONIZING PROPERTIES: CHILTON COAL FROM LORADO NO. 5 MINE, LORADO, LOGAN COUNTY, W. VA.—U.S. Bureau Mines Bull. 500 (1951).

This bulletin gives data on the carbonizing properties of coal No. 93, and its blends, as determined by the BM-AGA assay, the Gieseler and Davis plastometers, the sole-heated expansion oven and by various chemical and physical tests on the coal and the carbonization products. The Chilton coal is of high-volatile A bituminous rank, with 35.2% volatile matter, 0.7% sulfur, normal fluidity (for eastern coals), contracting 20.3%, 7.9% and 4.3% respectively for 100%, 80% and 70% Chilton in blends at 55.5 pcf. Yields of 10,600 cu.ft. gas/ton, of 602 Btu/cu.ft. are obtained at 900°C.

O. P. Brysch

Coal Preparation

Crentz, W. L., Bailey, A. L., and Miller, J. W. PREPARATION CHARACTERISTICS OF COAL FROM SOMERSET COUNTY, PA. U.S. Bureau of Mines Report of Investigations 4834 (1951) December.

This is the sixth in the series on preparation characteristics of coal beds by counties. Curves and tables of washability data on 14 samples are given. These are from the four principal seams,—the Upper Freeport, Lower Freeport, Upper Kittanning and Lower Kittanning and 5 minor seams. Fine crushing and mechanical cleaning yield a satisfactory metallurgical coal. The principal coals here are of low-volatile bituminous rank. Only 5% of the production (1949) of 4,961,339 tons was cleaned (in three pneumatic plants). O. P. Brysch

Coal Resins

Lee, E. D. and Schefbauer, R. J., Jr. (assigned to Interchemical Corporation) RESINOUS PRODUCTS OF THE REACTION OF STYRENE WITH RESINS DERIVED FROM BITUMINOUS COALS OF UTAH. U.S. 2,582,139 (1952) January 8.

Commercially useful resinous copolymers are produced from the hexane-soluble resins occurring naturally in certain Utah bituminous coals. The mildly oxidized resin, with 5 to 50 parts of styrene, in a hydrocarbon solvent is heated to 50° to 200°C in the presence of amphoteric metal halide catalysts. O. P. Brysch

Coke Oven Technique

Dobson, F. W. (assigned to The Woodall-Duckham Co., Ltd., England) COKE OVEN BUCKSTAY STRUCTURE. U.S. 2,582,238 (1952) January 15.

A short buckstay (from oven-sole to roof) for cross-regenerative coke ovens is proposed. Bowing of the stay is prevented by the usual roof tie-rods and by adjustable resilient support, at the oven-sole level, upon the reinforced framework of the battery benches. This framework in turn is rigidly fastened to the concrete pad-

foundation of the battery, and supports several lower grill-members which restrain the regenerator brickwork.

O. P. Brysch

Harlow, E. V. (assiged to Koppers Company, Inc.) METHOD OF DRY QUENCHING COKE. U.S. 2,581,409 (1952) January 8.

Improved operation in dry quenching of coke is obtained by separating the hot coke into coarse and fine fractions, and charging these to individual cooling chambers. The fractions are cooled by separate streams of inert gas recycled through the chambers and then through a waste-heat boiler. The fine coke may be burned by injection of air to provide heat for the boiler during periods of variable coke production.

O. P. Brysch

Nash, C. W. (assigned to Woodall-Duckham Co., England) COKE OVEN WITH GAS RECIRCULATING MEANS. U.S. 2,580,121 (1951) December 25.

Gas is circulated through the gas-space of the oven from opposite ends, first in one direction and then in the other, by means of a special, reversible-thrust fan in a bypass pipe between the two side collecting-mains. The temperatures in the gas spaces of the ovens are thereby controlled to avoid pyrolysis of the escaping by-products.

O. P. Brysch

Coking Heavy Oils

Garwin, L. and Steinkuhler, B. E. COKING OF HEAVY RESIDUAL OILS: A LABORATORY - PILOT PLANT CORRELATIVE STUDY. *Ind. Eng. Chem.* **43**, 2586-2592 (1951) November.

This study resulted in the operational data, product distribution, and quality information for the coking of several heavy residual oils. High grade electrode coke was made with a yield equal approximately to the Conradson carbon residue value of the feed stock.

B. G. Lang

Distribution

Charnley, F. S. SOME ASPECTS OF DISTRIBUTION CONTROL AS APPLIED TO INTERLINKED UNDERTAKINGS. PART I. *Gas Times* (British) **69**, 475-480 (1951) December 28.

The advantages of an interlinked system can best be realized by proper scheduling of the production facilities. By the use of weather data the demands in various districts can be estimated and the total production predicted. Any economies obtained by the integration of manufacturing facilities are gained at the expense of distribution costs. As a result much care must be taken in the design of mains and gas pumping installations.

B. E. Hunt

Dust Removal from Gases

Siechert, P. and Menardi, H. B. GLASS BAGS CLEAN CALIFORNIA AIR. *Iron Age*, **169**, 78-80 (1952) January 24.

Smoke control equipment in the form of silicone-impregnated glass bags has effectively removed solids from cupola emission in a gray-iron foundry at Alhambra, Calif. Several other types were studied before the selection of bags: inertia or cyclone equipment, spray chambers and/or scrubbers, sonic precipitators and electrical precipitators. Solids concentration ranges from 0.8 to 1.6 grains per cubic foot of stack emissions. About 75% is coarser than 325 mesh. The bags selected withstand temperatures as high as 550°F with a life expectancy of 12 to 18 months. The bag house operates under a gauge pressure of 3 to 4 inches of water and handles up to 4 cubic feet of gas per square foot of bag area. Bags are 11½ inches in diameter by 15 feet long

J. D. Parent

Effluent Liquor Purification

Cooper, C. and Bouch, W. E. INVESTIGATIONS INTO A NEW METHOD OF EFFLUENT LIQUOR PURIFICATION. Inst. Gas Engrs. Publ. No. 399: *Gas World* (British) **134**, 594-600 (1951) December 29: **135**, 80-83 (1952) January 19: *Gas J.* (British) **269**, 103-108, 113 (1952) January 9.

The paper is a preliminary report on using the nitric and nitrous acids for destroying the toxic matter in gas works effluents, especially in ammonia-still effluents. The high oxygen-absorption values of such liquids, due primarily to the

content of thiosulfate, thiocyanate and phenolic compounds, are reduced considerably, as shown by laboratory tests. The first two compounds are destroyed by boiling with HNO_3, to form ammonium sulfate, H_2SO_4 and NO. In addition, the thiocyanates yield HCN, which may be a recoverable product in large plants. Previous treatment to remove phenols appears to be advantageous, as the nitro-phenols formed by the proposed method are quite stable and would require special charcoal treatment. The sale of crude HCN and phenols affords reduction in operating costs. The catalytic oxidation of the plant's own ammonia to nitric acid is proposed, and the recovery and recycling of oxides of nitrogen from the off-gases of the process would be necessary. Costs, and comparisons with present effluent treatment methods are discussed.

O. P. Brysch

Fluidized Carbonizer

Roetheli, B. E. (assigned to Standard Oil Development Co.) METHOD FOR HANDLING FUELS. U.S. 2,579,398 (1951) December 18.

This invention is a fluidized process for conversion of solid carbonaceous fuels into volatile byproducts and fuel gases. It comprises three vessels,—carbonization, gasification and combustion,—through which the solids pass in succession. Heat is supplied by recycling hot fluidized solids from the combustion zone to the other zones, or by burning with oxidizing gas some of the solids in the latter zones.

O. P. Brysch

Fluidized Catalytic Desulfurization

Odell, W. W. (assigned to Standard Oil Development Co.) PROCESS FOR THE REMOVAL OF OXIDIZABLE SULFUR COMPOUNDS FROM A HYDROCARBON GAS MIXTURE. U.S. 2,581,135 (1952) January 1.

A preheated mixture of hydrocarbon gas and oxygen, or other oxidizing agent, is passed through a fluidized catalyst bed comprising kaolin, alumina, or iron oxide, maintained at 300-450°C. Hydrogen sulfide present is preferentially oxidized to sulfur (without appreciable oxidation of other gaseous components) which is condensed and removed from the gas stream. Organic sulfur compounds such as carbon disulfide may also be removed in this manner.

C. E. Hummel

Gas Dehydration

Waller, M. M. (assigned to Baker & Co., Inc.) APPARATUS FOR THE PURIFICATION AND DRYING OF GASES. U.S. 2,577,720 (1951) December 4.

An apparatus is described for the dehydration of purified gases from oxygen or hydrogen. Platinum or palladium deposited on activated alumina is used as catalyst for the purification step. The wet gas is dried by passage through silica gel until the drying agent is no longer effective for producing a gas of the desired dew point. Wet purified gas is then used to purge water from the drying agent heated to 300-400°F.

C. E. Hummel

Hydrogen Manufacture

Beekley, J. S. and Vail, W. E. (assigned to E. I. du Pont de Nemours & Co.) PROCESS OF REMOVING SULFUR COMPOUNDS AND CARBON MONOXIDE FROM HYDROGEN. U.S. 2,580,068 (1951) December 25.

Sulfur compounds and carbon monoxide are removed from a hydrogen-rich gas substantially free of oxygen by means of a catalytic converter at 200-400°C, and under a pressure between 100 and 500 psig. Copper-zinc catalyst is used for sulfur removal, and a nickel-chromite catalyst permits carbon monoxide removal (by methanation) down to 1 ppm or less. Sulfur reduction from 0.03 grains/CCF to 0.001 grains/CCF is reported.

C. E. Hummel

Shapleigh, J. H. (assigned to Hercules Powder Co.) MANUFACTURE OF HYDROGEN. U.S. 2,571,953 (1951) October 16.

A naturally occurring mineral carrier, the calcined composition being at least 80% alumina and iron oxide, free from mineral vitrifiable at temperatures below 2400° F, is claimed for the manufacture of hydrogen from steam and hydrocarbons from 1100° F. to about 2400° F.

W. J. Pleticka

Low Temperature Carbonization

COAL CARBONIZATION MAY OPEN DOOR TO COMMERCIAL SYNTHETIC FUELS. *Petroleum Processing* 7, 45 (1952) January.

The low-temperature carbonization process of the Pittsburgh Consolidation Coal Co. is discussed as an approach to synthetic liquid fuels, by the steps of (1) hydrogenation of the tars (2) char conversion into synthesis gas and then into Fischer-Tropsch gasolines.

O. P. Brysch

Peak-Load Producer

Ward, D. J. PRODUCER GAS FOR PEAK LOADS. *Gas J.* (British) 268, 689-692 (1951) December 12; *Gas World* (British) 135, 71-73 (1952) January 19.

A description is given of the operation of a second-hand gas producer to produce diluent gos for peak load conditions at the Windsor Street (Birmingham) plant. The capacity of the existing carburetted water gas plant (average peak make of 8.7 MMcf/d) had become "base" load capacity, due to increased winter demand, and to heavy repairs on the continuous vertical retorts (average peak make of 23.0 MMcf/d). Heavier charging of retorts has permitted full use of the 3.0 MMcf/d. of 132 Btu coke producer gas to give with ease 26 MMcf. of coal:producer mixed gas, with a reserve of up to 9.0 MMcf of water gas. A record total of 39. MMcf/d has been achieved. Under average loads, operations can be conducted to conserve coal or gas oil. The higher mixed-gas specific gravity has caused no distribution difficulties.

B. G. Lang

Propane Peak Shave

Tankersley, G. J. GEORGIA PEAK SHAVE PLANT USES ORIFICE FLOW CONTROL. *Gas* 27, 36-37, (1951) December.

The desired mixture of propane and air is obtained by controlling flow of propane by means of a butterfly valve and ratio controller. The air flow is measured (and not controlled) by a flange-tap orifice which through a ratio controller opens and closes the butterfly valve on the propane line to get the right propane-air mixture. The flow of mixed gas is also similarly controlled by an orifice and butterfly valve.

D. C. Gami

Underground Electrocarbonization

Forrester, J. D. and Sarapuu, E. THE PROCESS OF UNDERGROUND ELECTROCARBONIZATION. Technical Series No. 78, Missouri School of Mines (Rolla) (1952) January.

Results are reported on experimental underground electrocarbonization carried out from September 1, 1947 by the Missouri School of Mines, and from June 1, 1948 to June 1, 1951 by cooperation of the school and the Sinclair Coal Co. A resume is given of results of underground gasification studies on oil shale and coal in Russia, Sweden, Estonia, Germany, Belgium, Italy, England and the United States. A review of the principles and problems encountered in achieving gas quality and oil recovery is then given, followed by studies of electrocarbonization principles and laboratory studies of conductivity and path of current. The field experiments at the Tiger Mine, Hume, Mo. are then described in 33 pages (of 85 total). Apparatus, electrode layouts, time-resistance curves, gas analyses (550 to 130 Btu) and cost data on 5 types of tests are given. The changes in the coal seam after the stages of electrolinking, electrocarbonization and electrogasification (air blowing) are illustrated. The method is suitable for creating underground channels for gasification purposes without preparatory mining operations.

O. P. Brysch

Wood Carbonization

Wright, R. H. and Hayward, A. M. KINETICS OF THE THERMAL DECOMPOSITION OF WOOD. *Can. J. Techn.* 29, 503-510 (1951) December.

The kinetics for the rate of decomposition of wood has been worked out in this article from the data obtained by decomposing wood of varying shapes and sizes. The order of reaction and the reaction-rate constant varied with the physical nature of the woods and not with their chemical make-up.

S. Mori

The following article, the abstract for which appears on the page indicated, is also called to your attention:

NAPHTHALENE: NOW AND TOMORROW. p. 61

5. NATURAL GAS AND NATURAL GAS CONDENSATES

Compression by Turbines

Putz, T. J. WHAT THE GAS TURBINE CAN CONTRIBUTE TO NATURAL GAS TRANSMISSION. *Gas Age* 108, 31-33, 59, 60 (1951) December 20.

Comparative studies have been made to determine the economic advantages between the gas-turbine driven centrifugal compressors and the conventional direct-driven reciprocating gas engines. As a result of various calculations on a theoretical transmission line 1000 miles in length, it was concluded that gas turbines could be economically used to drive centrifugal compressors in gas lines 20" in diameter and larger. The claimed advantages for gas turbines are (1) reduced capital investments for stations and lines, (2) lower cost per unit of gas transported (3) station-simplicity (4) freedom from large water supply problem (5) reduced maintenance, and (6) ease of adaptation for remote control. (However, no comparative data are presented).

D. C. Gami

Drilling Costs

Siskind, D. DRILLING COSTS. DETAILED EXPENDITURES FOR BOTH DRILLING CONTRACTORS AND COMPANY OWNERS FACILITATE ESTIMATION OF FUTURE COSTS. *Petroleum Engr.* 24, B14-B18 (1952) January.

A great amount of data on drilling costs is given. Cost of rotary and cable drilling, distribution of costs by operations, equipment, wages and materials are all presented in detail. Drilling costs have risen 30% since 1947.

J. D. Parent

Ethylene Recovery

Deming, P. H. and Sagenkahn, M. L. (assigned to Shell Development Co.) FRACTIONATION PROCESS. U.S. 2,577,701 (1951) December 4.

The inventor claims a process of separating ethylene from other constituents of a mixture having a narrow boiling range, or closely similar boiling temperatures, by separating into a vapor and a liquid fraction, compressing adiabatically the vapor fraction to raise its temperature above that of the liquid, simultaneously liquefying a portion of the vapor fraction and vaporizing a portion of the liquid fraction by heat exchange between fractions, then returning the residual portions of these fractions as reboiling, refluxing and condensing means.

O. P. Brysch

Gas Dehydration

Armstrong, T. HYDRATE HEADACHES. *Oil Gas J.*, 50, 186 (1952) January 28.

Triethylene glycol for well-head dehydration, with injection of glycol at the well-head in connection with low-temperature separation, and injection of methanol are mentioned as cures for hydrate troubles in gathering lines. Methanol appears attractive for a declining field or a growing field of unknown capacity. Glycol injection is attractive for the low temperature process where the pressure is too low to produce hydrate by cooling due to expansion.

J. D. Parent

Laurence, L. T. NATURAL-GAS DEHYDRATION USING TRIETHYLENE GLYCOL. *Oil Gas J.* 50, 76, 77 (1952) January 7.

The operating cost of these plants is about 20 cents day/MMcf of gas processed using electrically driven pumps. Pipeline dryness specifications of natural gas can be met by this unit in almost all installations where gas is being produced without compression, and where gas is being compressed with adequate cooling prior to dehydration.

D. C. Gami

Gas Separation

Etherington, L. D. and Scheeline, H. W. (assigned to Standard Oil Development Company) FRACTIONATION OF GASEOUS MIXTURES. U.S. 2,581,088 (1952) January 1.

In the present invention the refrigeration of a fractionating system is effected in stages, that is, only part of the total refrigeration requirement is effected at lowest temperature level, while the remainder of the cooling required above the point of feed supply comes at various

stages in the fractionation, and at progressively increasing temperature levels. Thus, while the number of separation stages will have to be increased, the total power requirements involved in the refrigeration system will be greatly reduced. This equipment is particularly suitable for the recovery of ethylene and propylene from hydrocarbon mixtures.

D. C. Gami

Roberts, I. (assigned to Elliott Company) METHOD AND APPARATUS FOR SEPARATING GASES. U.S. 2,582,068 (1952) January 8.

The invention relates to the separation of gaseous mixtures by refrigeration and liquefaction under pressure. In particular the separation of hydrogen from methane is considered. Cooling and rectification are the unit operations involved. Throttling of liquid and extracting energy from the vapor by performance of external work are used for some of the cooling.

J. D. Parent

LP-Gas Generator

Warriner, L. L. (assigned to Vapo-Gas Consolidated, Inc.) GAS GENERATING APPARATUS. U.S. 2,577,389 (1951) December 4.

This gas generating apparatus produces a gaseous fuel mixture from air and a volatile liquid hydrocarbon. It will produce a mixture of unvarying proportions and constant heating value without waste of liquid or residue.

B. G. Lang

Zapffe, F. NEW PORTABLE PROPANE-AIR UNIT MAKES SUITABLE NATURAL GAS SUBSTITUTES. *Gas Age* **109**, 15-18, 57-59 (1952) January 31.

Lone Star Gas Co. designed and built emergency apparatus to maintain gas service during relocation or repair of lines. Initial tests proved completely satisfactory when it became necessary to take out of service for several hours a natural gas transmission line serving a large community. Unit was constructed of standard stock items within three days; the original design is now improved and will be a permanent aid.

Author's Abstract

LP-Gas Recovery

Nelly, H. M., Jr. (assigned to J. F. Pritchard & Co.) METHOD OF RECOVERING DESIRABLE LIQUEFIABLE HYDROCARBONS. U.S. 2,582,148 (1952) January 8.

This patent is primarily concerned with hydrocarbon liquid recovery from condensate fluid. Fluid from the well is cooled somewhat and liquid is separated. The gas is further cooled by expansion and by refrigeration for further liquid recovery. Liquefied gas is compressed for return to the reservoir and is vaporized by heat exchange with the gas to be processed. This is said to eliminate much of the recompression cost by handling liquid rather than gas.

J. D. Parent

Ragatz, E. G. REPORT ON OPERATING THE RICH OIL RECTIFIER. *Oil Gas J.* **50**, 107-111, 112, 122 (1952) January 14.

Rich oil rectifiers are desirable for a net propane recovery in excess of 50%. Several adjustments of operating conditions are discussed with reference to the correlation with changes in quality of the plant intake.

E. C. Kovacic

LP-Gas Sales

Rugh, K. W. and Benz, G. R. BUTANE-PROPANE SALES GAIN 26%; USE IN GAS MAKING HOLDS STEADY. RE-VIEWING 1951. *Gas*, **28**, 36-37 (1952) January: *Gas Age* **109**, 24-27, 58-60 (1952) January 17: *Oil Gas J.* **50**, 46-47 (1952) January 7: *Butane-Propane News*, **13**, 50-54, (1952) January: *Nat. Petroleum News* **44**, 27-30 (1952) January 2: *Gas Heat*, **3**, 38-40 (1952) February: *LP-Gas* **12**, 123-126, 203 (1952) February.

Unabated growth in butane-propane sales is described in the authors' annual report. Total sales of 4.1 billion gal. in 1951, exclusive of gasoline or rubber usage, are reported. LP-gas sold direct by producers and marketers for engine fuel is now being included in "Domestic and Motor Fuel" with the gas sold by distributors. Sales to utilities are estimated at 252 million gal. the same as 1950. Additions of 1270 cars have brought the total to 11,572 LP-gas pressure-tank cars in service and 1071 more were under construction. Storage facilities have improved, but "summer fillups" appear advisable for 1952.

O. P. Brysch

LP-Gas Statistics

Casper, J. C. LIGHT HYDROCARBONS CONTINUE SOARING CLIMB. *Oil Gas J.*, **50**, 230-231 (1952) January 28.

Natural gas liquids production is given for the period 1947-1951. During 1951, more LPG was produced then natural gasoline, the average daily figures being 240,400 bbls. and 235,600 bbls. respectively. J. D. Parent

Production Problems

Texter, H. G. INTERNAL HYDROSTATIC PRESSURE TESTING AS A MEASURE OF PERFORMANCE VALUES OF OIL-WELL CASING AND TUBING. *Oil Gas J.* **50**, 78-85 (1952) January 7.

The present specifications for oil-well casings and tubings are discussed from the viewpoint of actual information on the working life of the material. It is recommended that a internal pressure test would be most indicative of the life expectancy of casings and tubing.

B. E. Hunt

Sulfur Recovery

Weber, G. OIL'S SULFUR BOOMLET INDUSTRY NEARING PEAK IN ITS SULFUR-RECOVERY CONSTRUCTION PROGRAM, BUT THE LONG-TERM OUTLOOK IS FOR MORE EXPANSION. *Oil Gas J.* **50**, 61-64 (1952) January 14.

The recovery of sulfur from natural gas and refinery gas is discussed. A table is presented containing a list of existing plants, a list of plants under construction and under consideration, the total daily capacity and present daily production, and the source of the gas processed by each plant. A minor boom is predicted for this industry, covering the next two years.

J. Wrozina

The following articles, the abstracts for which appear on the pages indicated, are also called to your attention:

Boyer, E. G. IS 100% NATURAL GAS THE ANSWER? p. 46

Duff, D. M. UTILITY SALES OF NATURAL GAS UP 15.4%. p. 45

Kornfeld, J. A. ITALY'S GAS SYSTEM. p. 46

6. PETROLEUM AND SYNTHETIC LIQUID FUELS

Catalyst Preparation

Bates, J. R., and Bond, G. R., Jr., (assigned to Houdry Process Corp.) METHOD OF PREPARING A SILICA-ZIRCONIUM OXIDE CATALYST FOR THE CONVERSION OF HYDROCARBONS. U.S. 2,580,641 (1952) January 1.

A catalyst consisting of a zeolite capable of combining with less than 2% sodium oxide is claimed suitable for cracking petroleum or other such hydrocarbons. W. J. Pleticka

Holmes, J. and Mills, G. A. AGING OF A BENTONITIC CRACKING CATALYST IN AIR OR STEAM. *J. Phys. & Colloid Chem.* **55**, 1302-1319 (1951) November.

Filtrol or acid-treated bentonitic clay has been subjected to air and steam treatment at temperatures of from 510° C to 1135° C. The cracking activity, surface area and pore structure have been recorded and an attempt at evaluation made. H. A. Dirksen

Houdry, E. J. and Harrison, J. W. (assigned to said Houdry) CATALYTIC STRUCTURE OF SILICA ON ALUMINA-COATED PORCELAIN. U.S. 2,580,429 (1952) January 1.

A process for the manufacture of an alumina-silica or porcelain cracking catalyst is claimed. W. J. Pleticka

Malina, L. E. (assigned to Eugene J. Houdry) DEPOSITION OF A METAL OXIDE CATALYST ON A CARRIER. U.S. 2,580,806 (1952) January 1.

A process for the manufacture of a catalyst, composing of a uniformly dispersed film of alumina, magnesia, beryllia or thoria on a catalytically inert support is claimed.

W. J. Pleticka

Pardee, W. A. (assigned to Gulf Research & Development Co.) REACTIVATION OF SILICA-ALUMINA CATALYSTS BY SILICA ADDITION. U.S. 2,579,123 (1951) December 18.

A method of reactivating silica-alumina catalysts by impregnating the catalyst with an alkyl

silicate or sodium silicate and than decomposing the silicate is claimed.

W. J. Pleticka

Catalytic Reforming

Foster, A. L. CATALYTIC REFORMING REBUILDS HYDROCARBONS. *Petroleum Eng.* 24, C3-C4 (1952) January.

A brief description of the five types of catalytic reforming units used by the petroleum industry is presented. W. J. Pleticka

Hydrocarbon Synthesis

Gilbert, W. I. and Montgomery, C. W. (assigned to Gulf Research & Development Co.) PROCESS OF SYNTHESIZING HYDROCARBONS. U.S. 2,579,663 (1951) December 25.

The patent presents a process to produce liquid hydrocarbon from a carbon monoxide steam mixture about 1:1 to 2:1 mole ratio using a reduced iron and/or cobalt catalyst at temperature of 50°F to 600°F and pressure of 150 to 300 psi.

H. A. Dirksen

McGrath, H. G. and Rubin, L. C. (assigned to The M. W. Kellogg Co.) SYNTHESIS OF ORGANIC COMPOUNDS. U.S. 2,580,116 (1951) December 25.

In the hydrogenation of carbon monoxide to produce liquid organic compounds comprising hydrocarbons and oxygenated organic compounds, the alkali-containing iron catalyst has a tendency to deteriorate by agglomeration. The patent by controlling operating conditions claims to overcome that tendency and to increase the efficiency of the process.

H. A. Dirksen

McMillan, W. A. (assigned to The Texas Co.) CATALYST FOR THE REACTION OF CARBON MONOXIDE AND HYDROGEN WITH UNSATURATED COMPOUNDS. U.S. 2,578,-144 (1951) December 11.

A method for preparing carbonylic compounds by the use of a cobalt salt of acetyl acetone at 100-400° F. and 200 to 5000 pounds psi is described.

W. J. Pleticka

Production

Martin, J. W. FIELD DATA ON OPERATION OF ORCO PROCESS NEAR RICHBURG, N. Y. *Oil Gas J.* 50, 82-84 (1951) December 13.

Results of a two-year test in which carbon dioxide was injected into four wells of a five-spot water-flood area of 0.43 acres are reported. Oil production increased to a peak of 2.57 bbl. per day; previous production had been ¼ bbl. per day. Organic acids were found in the produced water and the hydrocarbon gas-to-oil ratio increased naturally. Considerable quantities of higher unsaturated hydrocarbons were found in these gases. O. T. Bloomer

Shale Oil

Berg, C. OIL SHALE AS A FUEL RESOURCE. *Petroleum Eng.* 24, A37-A43 (1952) January.

Some of the more recent advancements in the mining, retorting, and refining of shale and shale oil are reviewed. W. J. Pleticka

Synthetic Fuels Prediction

Ayres, E. SYNTHETIC LIQUID FUELS—WHEN AND HOW. *Petroleum Proc.* 7, 41-44, (1952) January.

The author predicts the maximum production of petroleum for the world in 1985, and for the U.S. in 1965. He expects oil shale petroleum production to mature about 1965 and the utilization of coal by 1980. The coal utilization then would take the form of the Fischer-Tropsch synethesis with hydrogenation playing a lesser role, only after heavy petroleum residues, tar from low temperature carbonization of coal and shale oil had been more completely converted to motor fuels.

H. A. Dirksen

Synthesis Gas

Hirsch, J. H., and Boegel, M. J. (assigned to Gulf Research & Development Co.) PRODUCTION OF GAS COMPRISING HYDROGEN AND CARBON MONOXIDE. U.S. 2,578,475 (1951) December 11.

A process for producing hydrogen and carbon monoxide in a spark-ignition internal combus-

tion engine, using oxygen and natural gas as the feed, is claimed.

H. A. Dirksen

The following articles, the abstracts for which appear on the pages indicated, are also called to your attention:

Schuit, G. C. A. ACTIVATED ADSORPTION OF HYDROGEN ON NICKEL CATALYSTS. p. 57

COAL CARBONIZATION MAY OPEN DOOR TO COMMERCIAL SYNTHETIC FUELS. p. 52

7. ANALYTICAL METHODS AND TESTS

Aromatics Determination

Lumpkin, H. E. and Thomas, B. W. AROMATIC MOLECULAR WEIGHT DISTRIBUTION AND TOTAL AROMATIC CONTENT. DETERMINATION BY MASS SPECTROSCOPY. *Anal. Chem.* 23, 1738-1740 (1951) December.

In mixtures containing paraffins, olefins, naphthenes and aromatics, it is possible to rapidly determine the total aromatic content independently of the other components by the use of a mass spectrometer. The method described will also distinguish between benzene, toluene, C_8 and C_9 aromatics with considerable accuracy.

J. M. Errington

Electron Microscopy

McCartney, J. T. and Anderson, R. B. ELECTRON MICROSCOPIC REPLICA STUDIES OF POROSITY IN FUSED IRON CATALYSTS. *J. Appl. Physics* 22, 1441-1443 (1951) December.

A method for obtaining electron micrographs of a fused-iron synthetic ammonia catalyst is described. Positive impressions of the catalyst surface (polished and subsequently reduced) were made with both Formvar and silica, and the pore dimensions obtained from the resultant micrographs compared reasonably well with pore diameter estimated from surface area-pore volume data.

D. Werle

Gas Works Control

Bishop, P. C. GAS WORKS CHEMICAL CONTROL. *Gas World* (British), 135, 54-60 (1952) January 12.

A review is made of the chemical analyses and physical tests performed to check the operation of the gas-making process throughout the plant.

C. E. Hummel

Mercaptan Determination

Ellis, E. W. and Barker, T. DETERMINATION OF THIOLS IN HYDROCARBON GASES. *Anal. Chem.* 23, 1777-1779 (1951) December.

Mercaptans (thiols) present in hydrocarbon gases are absorbed in a vessel containing standard cupric acetate-acetic acid reagent. Potassium iodide solution is added and excess iodine released by residual cupric ion is titrated with standard thiosulfate solution. The difference between the original and final amounts of cupric ion indicates the amount of mercaptans present in the gas sample. Accuracy within 0.2 grain of sulfur per 100 cubic feet of gas is claimed, providing no hydrogen sulfide is present.

C. E. Hummel

8. GENERAL AND PHYSICAL CHEMISTRY

Activated Adsorption

Schuit, G. C. A. and De Boer, N. H. ACTIVATED ADSORPTION OF HYDROGEN ON NICKEL CATALYSTS. *Nature* (British) 168, 1040-1041 (1951) December 15.

Experiments on the kinetics of the chemisorption of hydrogen on a coprecipitated nickel-silica catalyst lead the investigators to the belief that the hypothesis put forward by J. K. Roberts is fully confirmed. Roberts first suggested that the oxygen content of the metal obtained after reduction (which depends on the temperature of reduction) is responsible for activated adsorption, presumably because part of the surface is covered by oxygen.

D. Werle

Carbon Structure

Straumanis, M. E. and Aka, E. Z. PRECISION DETERMINATION OF LATTICE PARAMETER, COEFFICIENT OF THERMAL EXPANSION AND ATOMIC WEIGHT OF CARBON IN DIAMOND. *J. Am. Chem. Soc.* 73, 5643-5646 (1951) December.

Using X-ray analysis, a number of constants were determined for the diamond modification of carbon. The lattice parameter at 20°C. for clean diamond is 3.56679 A. and the single C-C bond length is 1.54447 A. The atomic weight was determined to be 12.0096 and the thermal linear lattice expansion coefficient per °C. is $(1.38 \pm 0.12) \times 10^{-6}$. With the possible exception of silicon, impurities appear to be mechanically occluded.

S. Katz

Combustion Research

Calcote, H. F. and Pease, R. N. ELECTRICAL PROPERTIES OF FLAMES; BURNER FLAMES IN LONGITUDINAL ELECTRIC FIELDS. *Ind. Eng. Chem.* 43, 2726-2731 (1951) December.

A study was made of the effect of a longitudinal electric field on the stability of a burner flame. Specifically, blow-off limits, dead space, and flame pressure were investigated. In general it was found that a field positive with respect to the burner increased the flame stability while a negative field decreased the stability. The large number of ions which must be present to produce these effects cannot be accounted for thermodynamically, and is probably due to chemi-ionization. E. F. Searight

Caldwell, F.R., Broida, H. P., and Dover, J. F. COMBUSTION IN BUNSEN FLAMES. *Ind. Eng. Chem.* 43, 2731-2739 (1951) December.

Experimental apparatus for determining burning velocities is discussed. The set-up employed a nozzle enclosed in a case to permit varying of pressure. It is felt that a nozzle will produce better results than the conventional bunsen burner, since it will have a more nearly uniform velocity over its cross-section. The burning velocity was determined by direct measurement using a schlieren optical system. Flame temperatures were determined by the sodium-line reversal technique. E. F. Searight

Di Piazza, J. T., Gerstein, M., and Weast, R. C. FLAMMABILITY LIMITS OF HYDROCARBON-AIR MIXTURES. REDUCED PRESSURES. *Ind. Eng. Chem.* 43, 2721-2725 (1951) December.

Flammability limits of hydrocarbon-air mixtures were determined at reduced pressures for a number of compounds in order to determine the effect of molecular weight, degree of saturation, and branching in these limits.

E. F. Searight

Gerstein, M., Levine, O., and Wong, E. L. FUNDAMENTAL FLAME VELOCITIES OF HYDROCARBONS. *Ind. Eng. Chem.* 43, 2770-2772 (1951) December.

Maximum burning velocities have been determined for a number of hydrocarbons. These determinations indicate a number of effects of molecular structure. It is found that unsaturation increases the burning velocity while methyl substitution, increased chain length, or increased number of carbon atoms in a ring tend to decrease the flame velocity.

E. F. Searight

Simon, D. M. FLAME PROPAGATION—ACTIVE PARTICLE DIFFUSION THEORY. *Ind. Eng. Chem.* 43, 2718-2721 (1951) December.

Flame velocities determined by the tube method for 56 hydrocarbon-air mixtures are correlated by the theoretical active particle concentration. An additional 11 points determined by the bunsen burner method are correlated in a similar manner. The Tanford and Pease equation has been found to predict the flow velocities with fair accuracy except in the case of ethylene and acetylene. The burning velocities for hydrocarbon-air mixtures are also found to correlate with equilibrium flame temperature.

E. F. Searight

Equation of State

Brough, H. W., Schlinger, W. G. and Sage, B. H. EVALUATION OF EQUATION OF STATE CONSTANTS WITH DIGITAL COMPUTERS. *Ind. Eng. Chem.* 43, 2442-2446 (1951) November.

The discussion considers the application of least squares technique by means of an automatic digital computer to the evaluation of constants of the Benedict equation of state for the lighter hydrocarbons which yield a minimum deviation of the compressibility factor from experimental value. The method appears to be promising for the direct evaluation of constants for the equation of state from the experimental data without the need for intervening graphical or numerical smoothing operations. D. C. Gami

Hydrocarbon Solubilities

Herington, E. F. THE SOLUBILITY OF AROMATIC HYDROCARBONS IN WATER. *J. Am. Chem. Soc.*, 73, 5883-5884 (1951) December.

The thermodynamic properties of aromatic hydrocarbons in solution with water were obtained, choosing infinite dilution and 1 mm. of Hg vapor pressure of solute as the standard state. Previously, the standard state was the pure hydrocarbon. The new standard state had the advantage over the previous one in that ΔS (solution) and ΔH (solution) were temperature dependent between 0-40°C, and ΔF (solution) is a linear function of temperature. S. Mori

Isotopic Hydrocarbons

Kemp, L. C., Jr. (assigned to The Texas Co.) PREPARATION OF HEAVY HYDROCARBONS OF HYDROGEN ISOTOPES. U.S. 2,577,017 (1951) December 4.

A method of preparation of hydrocarbons with D_2 instead of H_2 is outlined in this patent. The feed material consists of very pure carbon rod and D_2O. The carbon dioxide and D_2 products are separated. The former is passed through a bed of more carbon to get carbon monoxide. The carbon monoxide is reacted with D_2 over a suitable catalyst to form the hydrocarbon. Any undesirable D_2-containing hydrocarbons are recycled back to the D_2O inlet. S. Mori

Phase Equilibria

Reamer, H. H., Sage, B. H., and Lacey, W. N. PHASE EQUILIBRIA IN HYDROCARBON SYSTEMS: VOLUMETRIC AND PHASE BEHAVIOR OF THE PROPANE-CARBON DIOXIDE SYSTEM. *Ind. Eng. Chem.* 43, 2515-2520 (1951) November.

Carbon dioxide is an important non-hydrocarbon component of petroleum. A study of the volumetric and phase behavior of binary mixtures of paraffin hydrocarbons and petroleum is of engineering value in predicting such characteristics for underground reservoirs. The influence of pressure and temperature on four mixtures of propane and carbon dioxide was established experimentally at pressures up to 10,000 pounds per square inch, at eight temperatures between 40° and 460° F. In this temperature range the compositions of the coexisting liquid and gas phases were determined throughout the heterogeneous region. The results are presented in graphical and tabular form. The present measurements of the phase behavior of the propane-carbon dioxide system are not in good agreement with earlier studies of this system. The influence of pressure and temperature upon the equilibrium ratios is similar to that encountered in other binary systems involving carbon dioxide and a hydrocarbon. The information presented, together with other available data, should permit the prediction of the partial volumetric and phase behavior of carbon dioxide in more complex systems. Authors' Abstract

Sulfur Requirements

Foster, A. L. FOUR SULFUR STREAMS YIELD SULFURIC ACID. *Petroleum Eng.* 24, C5-C13 (1952) January.

The processing of plant-recovered sulfur to produce 98 per cent acid required as catalyst for an alkylation plant is described. Effluent

from a Girbotol unit, spent alkylation acid, acid sludge, and melted elemental sulfur are burned together in a furnace at 2000°F. Oxidation of sulfur dioxide to the trioxide is effected in two stages using vanadium oxide as the catalyst.

C. E. Hummel

SULFUR. *Chem. Eng.* 59, 165-176 (1952) January.

A detailed report is given on the availability, production, and utilization of sulfur. Additional supplies of sulfur from salt domes, sour gases, and miscellaneous sources to be in use by 1953 are listed. A discussion of possible sources of sulfur for future use is presented together with measures for conserving existing supplies.

C. E. Hummel

Thermal Diffusion

Davenport, A. N. and Winter, E. R. DIFFUSION PROPERTIES OF GASES. PART V. THE THERMAL DIFFUSION OF CARBON MONOXIDE, NITROGEN AND METHANE. *Trans. Faraday Soc.* (British) 47, 1160-1169 (1951) November.

Thermal diffusion factors for CO, N_2 and CH_4 have been determined for several temperatures, and the results are in good agreement with estimates based on theoretical models. Experimental studies on thermal diffusion columns were made on the separation of ^{13}CO and $^{15}N^{14}N$ from the normal gases and the results were correlated with existing theories.

S. Katz

Thermodynamic Properties

Benedict, M., Webb, G. B., Rubin, L. C., Friend, L. AN EMPIRICAL EQUATION FOR THERMODYNAMIC PROPERTIES OF LIGHT HYDROCARBONS AND THEIR MIXTURES. REDUCTION OF EQUATION TO CHARTS FOR PREDICTION OF LIQUID-VAPOR EQUILIBRIA. *Chem. Eng. Progress* 47, 609-620 (1951) December.

A total of 324 charts for 12 hydrocarbons at 26 pressures between 14.7 and 3,600 psia are presented. The temperature range from −100° to +400°F and the molal average boiling point range from −255°F to +180°F are covered. Examples to show the use of the charts for calculating bubble points, dew points, and equilibrium flash separations are given. Detailed comparison of the charts with equations and experimental data on the systems containing up to 5 components are made. The agreement is good. The authors have clearly shown the uses and the limitations of these charts for engineering purposes. [See also *Gas Abs.* 7, 255 (1951) November; 8, 15 (1952) January.]

D. C. Gami

9. ORGANIC CHEMISTRY

Cyclooctatetraene

Barnes, C. A. (assigned to General Aniline & Film Corp.) METHOD OF PREPARING CYCLOOCTATETRAENE. U.S. 2,579,106 (1951) December 18.

An improved method of preparing cyclooctatetraene by polymerizing acetylene under pressure and elevated temperature in the presence of nickel catalyst using nitrogen as a diluent, tetrahydrofurane as a neutral solvent, and an anti-oxidant (.05 to 1%) to avoid the presence of tetrohydrofurane peroxide during the reaction.

W. J. Pleticka

Ethylene Chemicals

Nelson, C. R., Taylor, M. A., Davidson, D. D. and Peters, L. M. (assigned to Shell Development Company) OLEFIN HYDRATION PROCESS. U.S. 2,579,601 (1951) December 25.

A method for the continuous production of ethanol from ethylene by means of a supported phosphoric acid bed, at a temperature between 270 and 310°C and at a pressure greater than 400 psi. is claimed.

W. J. Pleticka

Robertson, N. C. and Allen, R. T. (assigned to Celanese Corporation of America) PRODUCTION OF ETHYLENE OXIDE. U.S. 2,578,841 (1951) December 18.

The inventor proposes a novel silver-barium peroxide-zinc oxide catalyst supported on alumina, used in the fluidized condition for air oxidation of ethylene to ethylene oxide.

O. P. Brysch

Ethylene Recovery

Sherwood, P. W. PRODUCTION OF ETHYLENE FROM PETROLEUM SOURCES. PART III. *Petroleum Refiner* 31, 126-130 (1952) January.

The general principles, design considerations and characteristics of the four commercially successful methods for the separation and purification of ethylene from cracked gases are reviewed. Low-temperature fractionation is the method most commonly employed. Low-temperature precludes the use of carbon steel so that aluminum or nickel steel towers must be designed to withstand pressures of 400-600 psig. Major utilities consumption per ton of ethylene includes: 1300 kwh, 1400 lb low-pressure steam and 52 M gal cooling water. Second, when feed gases of low-ethylene concentration are to be handled, an oil absorption step preceding fractionation makes for more economical operation. Total refrigeration power requirements are 930 kwh per ton of ethylene produced. A third process is hypersorption which involves continuous countercurrent adsorption on activated charcoal. Electric power requirements are of the order of 75 kwh per ton of ethylene produced. Fuel gas and steam requirements are 16 million Btu and 85 M lb respectively. In the fourth method ethylene is extracted by absorption in cuprous salt solutions. Ethylene solubility in this medium is a pronounced function of pressure. Absorption takes place at 300 psig and removal of ethylene from the solution is done at 150 mm Hg at 100-105°F. C. A. Hall

Naphthalene

NAPHTHALENE: NOW AND TOMORROW. *Chem. Eng.* 58, 375-379 (1951) January 29.

During 1951, the practical ceiling has been approached on the advances in recovery of naphthalene from available coal tar, since 85% of the crude tar in the country now is being processed. The estimated annual available naphthalene, 450 million lb., is only 80% recoverable, because of (1) obsolete recovery procedures and (2) incomplete availability of tar supply for recovery. Phthalic anhydride requirements are the major factor in the demand and are not likely to decrease. Shortages in the near future may be offset by (1) processing additional tar (2) improved tar refining technique (3) development of new sources, such as coal hydrogenation oils, or substitutes such as orthoxylene from petroleum.

O. P. Brysch

Propylene Petrochemicals

Irvine, V. C. PROPYLENE PETROCHEMICALS 3 BILLION POUNDS WERE PRODUCED LAST YEAR. *Petroleum Proc.* 7, 46-48 (1952) January.

Some of the various petrochemicals derived from propylene are discussed as to their use in industry. W. J. Pleticka

10. CHEMICAL ENGINEERING

Flow System Design

Rushton, J. H. APPLICATIONS OF FLUID MECHANICS AND SIMILITUDE TO SCALE-UP PROBLEMS. PART I. *Chem. Eng. Progress* 48, 33-38 (1952) January.

A brief review of the principles of dynamic similitude is given. Basic concepts of fluid mechanics are used to develop relations between fluid motion, equipment size, and fluid properties that may apply to chemical engineering work. A general method is given whereby the requirements for dynamic similitude for any flowing system can be determined. Examples are given showing how these principles can be used in pilot plant models to obtain scale-up data for operations involving resistance to fluid flow, discharge of liquids from tanks, blending of liquids by a mixer, control of forced vortexes, dissolving of solids during mixing, and absorption and desorption of gases in moving liquids. Suggestions are made for applying the principles to any type of operation involving mass transfer in a liquid, and to other flow operations such as fluidized systems and suspensions.

Author's Abstract

Fluidized Condensation

Winter, C. H., Jr. (assigned to E. I. du Pont de Nemours & Co.) CONDENSATION OF VAPORS. U.S. 2,580,635 (1952) January 1.

This patent claims a method for condensing and separating from a vaporous mixture a constituent which condenses directly to a solid by passing the hot gaseous mixture countercurrent to a flow of cold fluidized solids such as silica. E. J. Pyrcioch

Fluidized Heat Exchange

Ogorzaly, H. J. and Rex, W. A. (assigned to Standard Oil Development Co.) UTILIZATION OF HEAT OF FINELY DIVIDED SOLIDS. U.S. 2,581,041 (1952) January 1.

A method of recovering the sensible heat from fluidized solids reaction beds to preheat the fresh solids charge, specifically applied to oil shale distillation. The invention utilizes a 2-stage heat exchanger which includes preheating steam as a fluidizing medium and a Dowtherm heat exchanger. The application extends to all fluidizing operations. W. G. Bair

Heat Transfer

Kayan, C. F. HEAT TRANSFER EQUIPMENT ANALYSIS BY THE RESISTANCE CONCEPT. *Refrigerating Eng.* 59, 1195, 1199, 1240, 1241 (1951) December.

By means of the resistance concept of heat transfer, it is shown that the flow of heat is analogous to the flow of electricity. The flow of heat is seen to vary directly as the temperature difference and inversely as the thermal resistance. The method is outlined in some detail for the case of concurrent flow in a heat exchanger. B. E. Hunt

11. PROCESS EQUIPMENT AND INSTRUMENTATION

Barometers

Heiland, C. A. NEW PRECISION BAROMETER AND BAROGRAPH. *Mech. Eng.* 73, 971-974, 1001, (1951) December.

The present paper describes a precision aneroid barometer (micro-barometer) having an accuracy of 10 milli T (1 T = 1 Torr = 1 mm Hg) and a pressure range of 300 – 900 T, or elevation from 3300 – 23000 feet. The main features responsible for the increase in accuracy are (1) a helical Bourdon tube in place of metallic capsule and (2) the use of optical in place of mechanical amplification of deflection. The test data showed that the mean error for individual observations for determining elevation was ± 9 cm for this instrument while it was ± 60 cm with a conventional type aneroid. This micro-barometer could be adapted for continuous recording by the use of photo-electric recording attachment. D. C. Gami

Flow Regulator

Stripp, P. GAS PRESSURE GOVERNOR WITH GLASS VALVE. *Gas J.* (British) 268, 752 (1951) December 19.

A gas-pressure governor has been modified by a glass valve and spindle for use in regulating the flow of gas to an apparatus for H_2S determination. A sectional diagram of the device is supplied. C. E. Hummel

Gas Temperature Probe

Polye, W. R. (assigned to Bendix Aviation Corp.) TEMPERATURE PROBE. U.S. 2,579,271 (1951) December 18.

This patent claims a device for the measurement of high temperatures of gases having high velocities. The device employs a temperature-sensitive element, which is also resistant to corrosion, as part of an electrical temperature-measuring circuit. Claims made for the device are: accuracy at extremely high temperatures; no appreciable lag; resistance to thermal shock; reduced radiation losses from temperature-sensitive element; and, adaptability to govern temperature-control systems. E. J. Pyrcioch

Liquid Meters

Larson, J. O. AREA TYPE METERS IN REFINING APPLICATIONS. *Petroleum Eng.* 24, C15-C21 (1952) January.

Detailed comparison of variable area meters (Flowrator meters) and variable head meters (orifice meters) are given. Applications of Flowrator meters in handling acids, waxes, lube oils, caustic and chlorine are pointed out. D. C. Gami

Pipeline Safety Shutoff

Cronkhite, J. T. DEVICE FOR SHUTTING OFF GASES FROM PIPE LINES. U.S. 2,582,105 (1952) January 8.

This invention relates to a device for automatically shutting off flow in pipelines when the supply tanks empty thereby preventing air from being drawn into the lines. An automatic tripping means is provided so that when the head of a liquid again rises in the tank the flow is re-established. E. J. Pyrcioch

Pressure Regulator

Glasgow, C. O. (assigned to National Tank Co.) PILOT GAS REGULATOR. U.S. 2,578,005 (1951) December 11.

This gas regulator is designed for drawing off a small stream of gas at a reduced pressure from a large stream. It also has a heat exchange are so that there is no formation of hydrates to stop continuous operation of the regulator. B. G. Lang

Peterson, C. D. (assigned to Universal Controls Corp.) GAS SERVICE PRESSURE REGULATOR. U.S. 2,577,480 (1951) December 4.

This gas service regulator has a built-in downstream pressure relief device. The valve body has opposed inlet and discharge ports. There is a union connecting the valve body and operating diaphragm case, which allows the body to be positioned in any position relative to diaphragm case. Downstream pressure to the operating diaphragm comes from a pitot tube. This compensates for friction losses during high demands. B. G. Lang

12. MATERIALS OF CONSTRUCTION

Cathodic Protection

Allison, N. J. and Huddleston, W. E. EXTRANEOUS CURRENTS NOTED ON LARGE TRANSMISSION PIPE LINE SYSTEM. *Corrosion* 8, 1-13 (1952) January.

Stray currents fluctuating in both magnitude and direction were found which could not be explained in the usual manner. After a number of field observations it was decided that properly applied cathodic protection could safeguard the pipe line. B. E. Hunt

Corrosion

Evans, U. R. CORROSION PROBLEMS ARISING FROM WATER IN CHEMICAL INDUSTRY. *Chemistry and Industry, Suppl. "Water in Industry"* (British), 1193-1200 (1951) December 31.

The general aspects of corrosion,—direct oxidation and electrochemical reaction—are described. The theory and use of cathodic and anodic inhibitors are discussed. The various types of corrosion encountered in boiler waters, —oxygen pitting, copper pitting, and caustic cracking—are discussed.

B. E. Hunt

Parker, M. E. CORROSION AND ITS CONTROL. PART 41. LOW-TEMPERATURE HYDROGEN ATTACK OF STEEL. *Oil Gas J.* 50, 89 (1952) January 7.

Low temperature hydrogen attack on steel is believed to be caused by the recombination of atomic hydrogen, which has diffused to a void in the steel, to form molecular-hydrogen at a very high pressure. Two methods of detection are discussed. B. E. Hunt

Parker, M. E. CORROSION AND ITS CONTROL. Part 42. HIGH-TEMPERATURE HYDROGEN ATTACK ON STEEL. *Oil Gas J.* 50, 124, (1952) January 14.

The high temperature attack of steel by hydrogen is thought to occur as a result of the diffusion of molecular hydrogen into the steel followed by the formation of methane as a result of the reaction of the hydrogen with iron carbide. The attack can be minimized by reducing the hydrogen concentration in the environment or by replacing the susceptible steel by a more resistant one. Carbide-stabilized steels are more resistant. B. E. Hunt

Parker, M. E. CORROSION AND ITS CONTROL. Part 43. AMMONIA FOR ACID CORROSION IN REFINERIES. *Oil Gas J.* 50, 114 (1952) January 21.

The methods of injecting either liquid or vaporized ammonia into refinery equipment are described. The chemical reactions which might explain the action of the ammonia are discussed. B. E. Hunt

Parker, M. E. CORROSION AND ITS CONTROL. PART 44. METAL LININGS FOR CORROSION RESISTANCE. *Oil Gas J.* **50**, 371 (1952) January 28.

Metal linings can be applied to tanks in a variety of ways—clad metal, weld deposition, metal spraying, and sheet lining. This article discusses the four general procedures for applying sheet linings. B. E. Hunt

Parker, M. E. CORROSION AND ITS CONTROL. PART 45. PASSIVATORS AND INHIBITORS. *Oil Gas J.* **50**, (1952) February 11.

A basic attack on corrosion is afforded by the modification of the corrosive environment. This may be brought about by (1) a direct chemical or mechanical modification to remove the corrodent; (2) the addition of passivators which render the metal more noble and thus less subject to attack, or (3) the addition of inhibitors which form films thick enough to offer obstacles to the passage of the corroding fluid.

B. E. Hunt

Thornhill, R. S. EXPERIMENTAL APPROACH TO THE PROBLEM OF TUBERCULATION BY WATERS. *Chemistry and Industry, Suppl. "Water in Industry"* (British) 1201-1207 (1951) December 31.

The study of tuberculation or blistering of steel in water is described. Various types of water treatment—alkali addition, silicats addition, and polyphosphate addition—are discussed.

B. E. Hunt

Corrosion by Flue Gases

Pray, H. A., Peoples, R. S., Sims, C. T. and White, E. "RESEARCH IN CORROSION, OXIDATION, AND DETERIORATION OF METALS UNDER THE INFLUENCE OF PRODUCTS OF COMBUSTION OF GASEOUS FUELS." Report No. 3, AGA Project DGR-4-CH, THE CORROSION OF METALS AND MATERIALS BY THE PRODUCTS OF COMBUSTION OF GASEOUS FUELS. (64 pp.) November, 1951.

The corrosion behavior of some sixteen metals and ten coating systems when exposed to flue gases both with and without sulfur is reported in the form of graphs and charts. Corrosion rates were determined at sulfur (SO_2) levels of 0.0, 25.0, and 50.0 grains/CCF of 1000-BTU gas under conditions of (a) continuous condensation (80 F), (b) continuous heating (1325 F), and (c) cyclic operations between 80 F and 400, 600, and 825 F. Both average penetration (weight loss) and maximum penetration (maximum pit depth) were measured for each specimen. The stainless steels (quench annealed) showed definite superiority to any of the other materials tested. Closely following the stainless steels were 2S aluminum, Alclad 24S-T, aluminized steel, aluminum-coated steel and copper. The aluminum coating appeared to afford protection to the base metal even though the coating was damaged. Following this group were materials such as low-alloy steels, 5% chrome steel and cast iron with 1% chromium. This group was from 4 to 16 times more resistant than SAE 1010 steel. Ordinary gray cast iron, SAE 1010 steel, galvanized steel, terne-coated steel, lead-coated steel, and zinc showed very little resistance. Two types of aluminum-based paints were tested. They afforded some protection until they broke down and permitted the attack of the base metal.

B. E. Hunt

Scaling of Iron

Dunnington, B. W., Beck, F. H. and Fontana, M. G. THE MECHANISM OF SCALE FORMATION ON IRON AT HIGH TEMPERATURE. *Corrosion* 8, 2-13 (1952) January.

A kinetic mechanism for oxide formation on an iron surface at high temperature has been postulated. The controlling factor is the diffusion of the lattice vacancies into the iron. Two cases are studied, the first dealing with a firmly adherent oxide film, the other dealing with a loose oxide coating.

S. Mori

The following article, the abstract for which appears on the page indicated, is also called to your attention:

Texter, H. G. INTERNAL HYDROSTATIC PRESSURE TESTING OF OIL-WELL CASING AND TUBING. p. 55

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